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THE GOVERNMENT OF THE PHILIPPINE ISLANDS  
DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES  
BUREAU OF AGRICULTURE

BULLETIN NO. 34

# TOBACCO GROWING IN THE PHILIPPINES

BY

DOMINGO B. PAGUIRIGAN, B. S. A.,

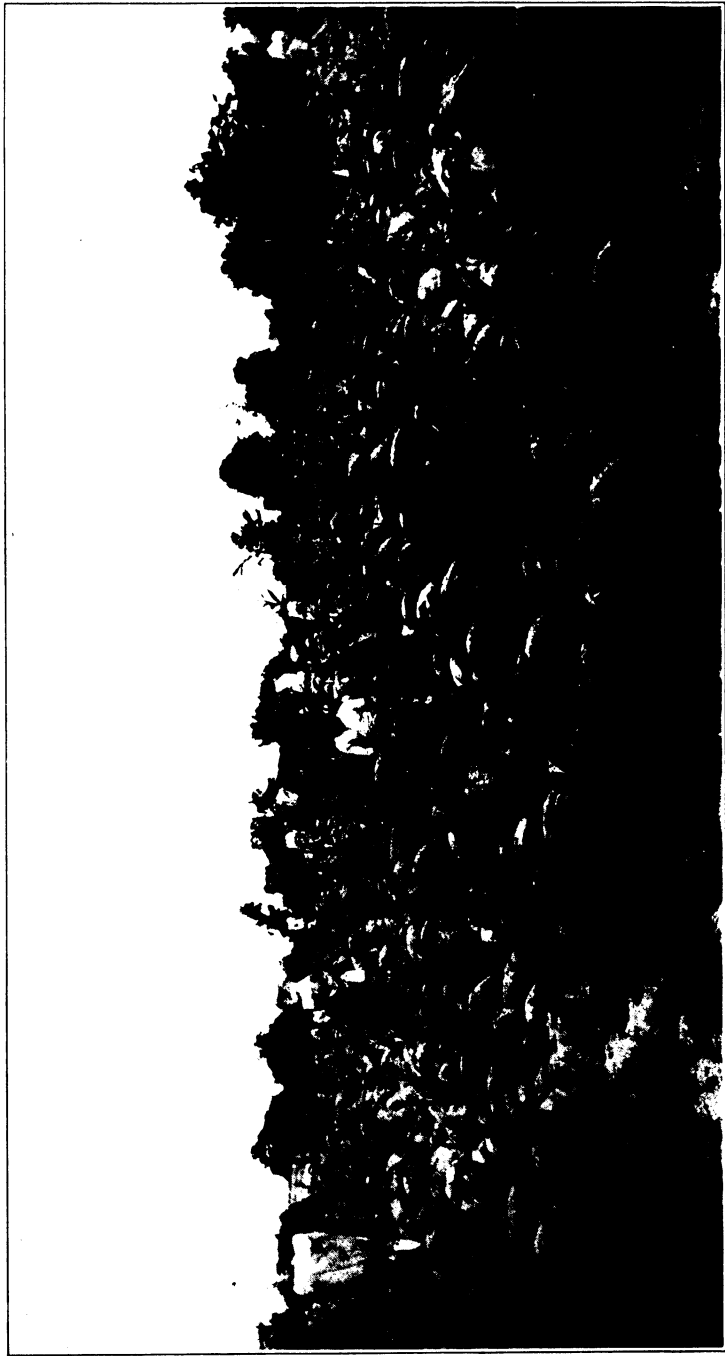
*Assistant to the Superintendent, Damnan Tobacco Station*

MANILA  
BUREAU OF PRINTING  
1919

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A Tobacco Field, Ilagan, Isabela Province.

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DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES  
*in Philippine Islands* BUREAU OF AGRICULTURE

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# TOBACCO GROWING IN THE PHILIPPINES

## INTRODUCTION

The importance of the tobacco industry in the Philippines as a whole can never be realized unless one is aware of the fact that this industry is one of the chief sources of revenue to the Insular Government. This being true in spite of the poor methods now prevailing in the tobacco districts, it is but reasonable to believe that, should the present methods of growing tobacco be improved, not only would the tobacco planters better their condition but the Philippines as a whole would also become wealthier through the subsequent increase of revenue. A better quality of Philippine tobacco would mean, too, a greater demand for the product by our foreign customers, so our farmers would raise or grow more tobacco and receive more "pagamento."

Heretofore the Bureau of Agriculture has not succeeded in reaping the full benefit of its efforts to help our farmers to adopt better methods of growing tobacco, principally because of the following drawbacks:

1. The average farmer has very little education or none at all. Consequently all the pamphlets, bulletins, and circulars on tobacco published by the Bureau are useless to him.

2. The average farmer is generally distrustful and ultra-conservative. He is very slow to accept—if he accepts at all—any part of the instructions that are actually given him by the traveling demonstrator or inspector of the Bureau.

But however conservative and ignorant the farmer may be, there is much hope for him. His children go to school and efforts must be made to instruct him indirectly through them. This pamphlet is especially designed for the purpose of furnishing a brief but comprehensive study of the growing and curing of tobacco in the Philippines.

The Philippines is especially fortunate in having regions such as the Cagayan Valley which are peculiarly suited to tobacco growing. But for this fact, the tobacco industry of the Philippines, shortly after the abolishment of the Government monopoly during the Spanish régime would have lost at least its foreign trade.

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<sup>1</sup> Amount received by a farmer for his yearly crop of tobacco leaf.

The most serious of all the tobacco problems that now confront the Islands is the wrapper supply; for which reason the production of wrapper tobacco will be fully covered in this pamphlet. Reports of the Bureau of Customs show plainly that the importation of leaf tobacco wholly for wrapper that might just as well be produced locally has been rapidly growing since the year 1912.

The next most important problem is seed selection.

#### THE TOBACCO PLANT

The following brief description of the tobacco plant is here given solely with the object of giving young students a good understanding of the instructions.

Tobacco (*Nicotiana tabacum*) is a herbaceous plant with large alternate and entire leaves. Its flowers are funnel-shaped, turning pinkish on blossoming. They occur on short racemes or branches which are grouped in a terminal panicle. The plant is tall and erect and grows to a height of about two and a half meters. It is pubescent all over and tends to branch at its upper length.

The plant grows best during a certain period or season of the year which; here, is September to March inclusive.

There are many distinct kinds (species) of tobacco which are in turn subdivided into several varieties, the classification being based principally on noticeable leaf differences and climatic adaptations. The Philippines is producing only a single species with which she should be satisfied (*Nicotiana tabacum*). There are four distinct important local varieties, namely: Espada (leaf long in proportion to its width), Pampano (leaf very broad and petiole short and broadly winged), Romero (leaf thick and very aromatic and petiole naked), and Repollo (medium-width of leaf more or less proportional to length).

On account of the fact that no real work on tobacco testing has ever been done in the tobacco districts, no definite recommendations as to which varieties are to be preferred will be given or mentioned here. The Tobacco Testing Station at Dam-mao, (Gamu, Isabela) has been too recently established (being only in its third year), to be in a position to give definite conclusions as to its work, especially along the line of testing of varieties.

There are three distinct products of tobacco in cigar tobacco production, namely, wrapper, binder, and filler.

Wrapper tobacco is raised especially for wrapping cigars. Consequently the leaves should be uniform in color, elastic, very pliable and with fine texture, and small veins, and

good finish. Filler tobacco is raised to form the main body of the cigar and therefore the leaves should be of good aroma and burn well. Binder leaves are not produced in any particular way, as are both of the other two products, but are incidentally obtained from a crop of either wrapper or filler tobacco. Binders, as the word indicates, are used to bind the fillers preparatory to wrapping.

#### SELECTION OF SOIL

The soil most suitable for growing tobacco is sandy loam, brown to yellowish brown in color, containing a good percentage of organic matter. The typical alluvium which is formed by the deposits of the river when overflowing its banks is of this class. It should be porous, deep, fresh, fertile (rich), and well drained, that is, not boggy. The color of the soil has a direct effect on the color of the leaves produced. Consequently the grower, in selecting his soil, should bear in mind the popular demand as regards color. Should he desire to grow light tobacco, he must select a light, well drained soil. A heavy, poorly drained soil produces a very strong, coarse tobacco which is good only for chewing tobacco or "mascada."

The inundated southern portion of the Cagayan Valley is an ideal location for the growing of cigar tobacco. The yearly overflow of the Cagayan River leaves a deposit which not only enriches the soil with silt and decayed stuff vegetation from the mountains but gives it also good drainage and light color. In the case of the uninundated tobacco lands, certain forms of fertilizers and manuring are necessary in order to secure or preserve the fertility of the soil. Better crops of tobacco can be produced and more economically and conveniently by green manuring with cowpeas, beans, and other leguminous crops and by animal manuring with horse or carabao dung. Commercial fertilizers should be used only when the price of tobacco is high enough to warrant their purchase.

#### SEED BEDS

Any soil that is good for raising field tobacco may also be used in the preparation of seed beds. Preference should be given, however, to very fertile or virgin (new), well drained lands (somewhat inclined or sloping). Whenever available, the ground should be high enough not to be subject to overflow or inundation. The seed bed should be in a place where baguios will not injure it, that is, protected by a grove of trees or uncleared thicket or provided with a good strong wind-break of some other kind.

The ground should be plowed three or four inches deep. The weeds should then be collected, dried, and burned over the surface. This practice will not only destroy many injurious insects and their eggs but also large quantities of weed seeds and spores of fungi that cause serious plant diseases which would destroy great numbers of the seedlings later on. The soil should be pulverized as completely as possible and then thrown up in low ridges about 8 centimeters high and 1 to 2 meters wide. The length depends on the length of the ground. Between the beds (ridges) should be a foot-path about 50 centimeters wide to use when sowing seed and weeding, so as to avoid trampling the seedlings. Incidentally, the path will serve as a draining canal in case of rains. The beds should be surrounded with firmly staked split bamboo in order to avoid the washing out of the seed, especially during heavy rains.

A chupa or a half liter of tobacco seed contains several millions of seed that should produce at least 100,000 good plants.

It is recommended that the grower sow his seed sparsely, because thick sowing not only causes the loss of plenty of good seed but produces weak and unhealthy seedlings, as the result of overcrowding.

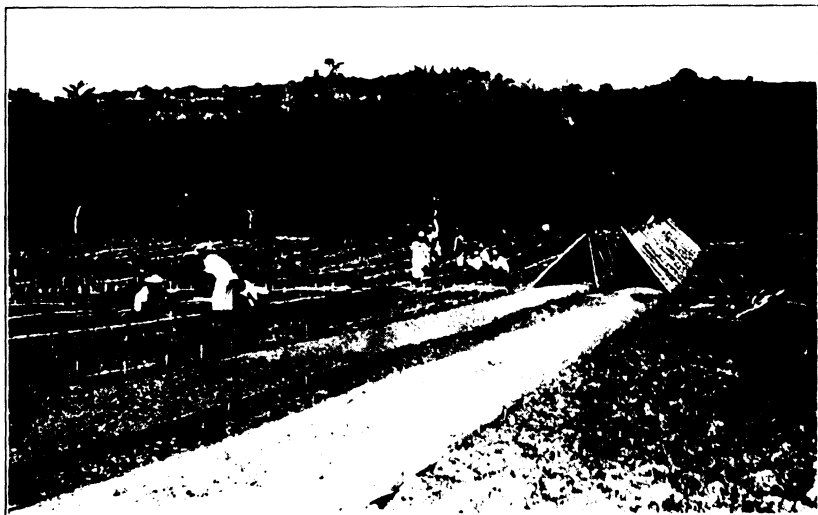
The following formula or mixture will give a good uniform sowing:

- 1 part of good selected and cleaned tobacco seed
- 1 part of wood ash
- 4 parts of clean sand

A half liter of tobacco seed mixed according to the above formula, if uniformly distributed, will cover a space of at least 16 square meters, producing from 8 to 10 thousand well developed plants.

Naphthalene powder or lemon oil will protect the sown seed from ants, but when neither of these can be had, corn meal slightly sprinkled around the seed beds will attract the ants, which will feed on this instead of on the sprouting seeds. Three seed beds should be prepared, at intervals of 20 to 30 days, beginning August 21-31 every year, as the weather permits. A fourth seed bed should also be prepared during November if possible. This serial preparation of seed beds is the best precaution against possible storms and unexpected drought.

After sowing the seed, keep the surface of the ground moist. Watering should be done by spraying in the afternoon. Watering in the morning is not good because in case of a sunny day the heated water on the leaves might burn them. The soil also is likely to bake unless it is raked or stirred in time. If a real



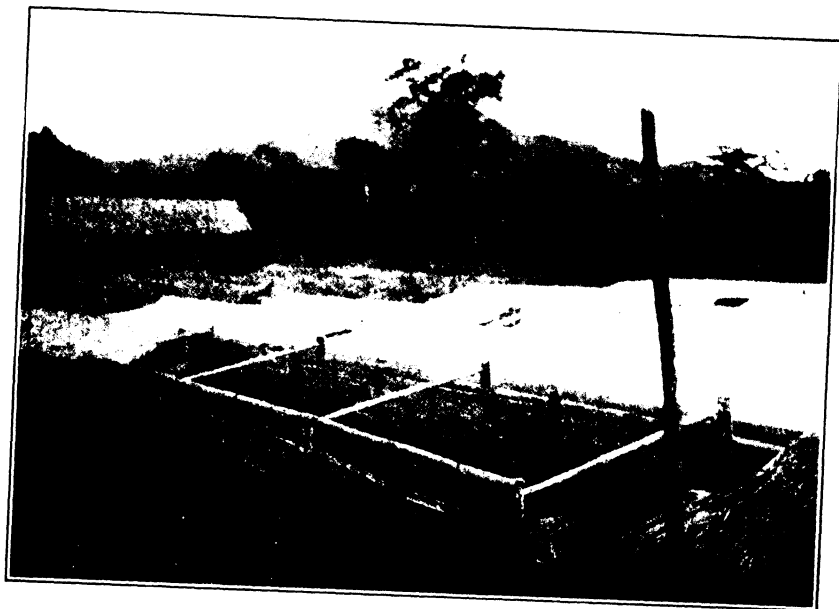
(a) Preparing Tobacco Seed Beds, Ilagan Tobacco Station, Isabela Province.



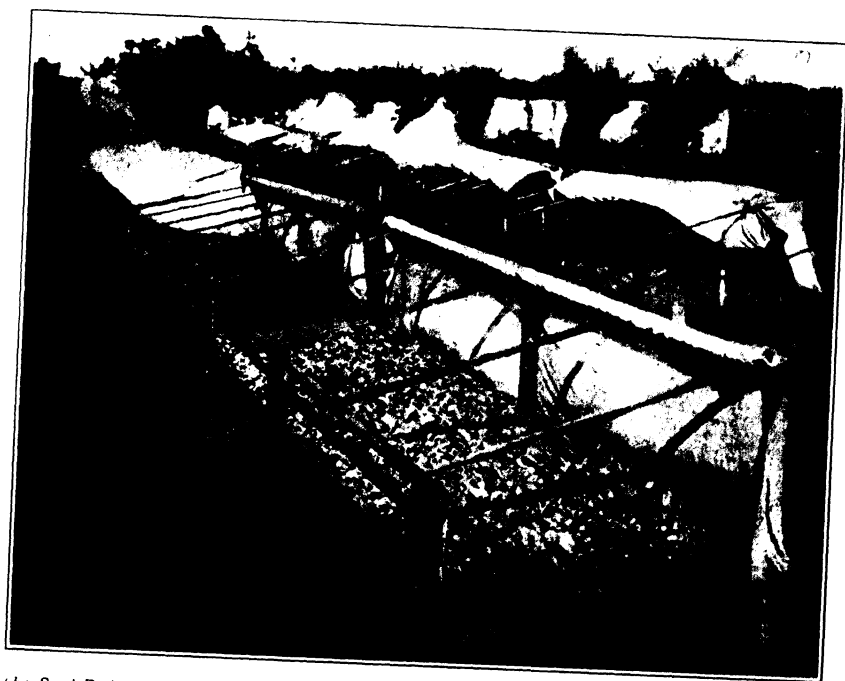
(b) Tobacco Seed Beds, Damiao Tobacco Station, Isabela Province.







(a) Seed Beds, Cloth Cover.



(b) Seed Beds, Showing Details of Construction, and Young Plants Coming up directly from Seed.



sprayer is not available, a rude brush of fine twigs may be used. Care must be taken, however, to see that the spraying is not too strong, otherwise the water will drive the seed too far into the ground or press down the seedlings; this will damage or prolong germination.

It is recommended that enough portable shelters of banana petioles, mats, thatch, or like materials, be ready in case of very hot days. The seed beds must be well fenced to protect them from stray animals.

Every germinating weed should be eradicated or destroyed at once. In any places where the seedlings are overcrowded, they should be thinned out at once also, that is, some of the seedlings should be removed in order to allow only the remaining seedlings to properly develop unmolested.

Mr. Pedro A. David, under the direction of Dean C. F. Baker, recently found the following method of preparing tobacco seed beds very effective at the Experiment Station of the College of Agriculture at Los Baños.

The beds are made one by six meters. This is a convenient size for many operations—constructing, weeding, managing covers, etc. The earth is raised about one foot above the general level in bed form and the sides of the beds are supported by bamboo. The paths between them are one-half meter in width.

Each bed is thoroughly spaded several times to a depth of more than one foot. All roots, sticks and other waste materials are removed by rake and hand, and the soil is thoroughly pulverized.

A suitable shelter made of cloth, nipa, cogon, or banana leaves is constructed for each bed. The shelter is raised above the ground to about two feet in front and one foot at the rear. Shade is important in reducing evaporation; the retention of the moisture enables the seeds to germinate quicker and more perfectly. It also saves the beds from being washed away by the heavy rains. Cloth shade gives the best results, although nipa, cogon and banana leaves are satisfactory enough.

#### FLATS

Flats are merely portable seed beds. They are very easily and cheaply made by simply buying, wholesale, empty kerosene boxes. The boxes are sawed sidewise into halves and then filled with three equal horizontal layers of: bottom layer, straw, dried leaves, or grass; second layer, coarse soil; and third layer, rich soil finely powdered. The upper layer will thus contain enough food for the young seedlings before transplanting, the second layer should be coarse enough to insure good drainage in

the box, and be loose enough, also to avoid interfering with the growth of the roots. The bottom layer simply helps drainage.

For small plantings of a few thousand plants, flats are more convenient than seed beds. In case of unexpected heavy rains or storms the seed beds are either wiped out or overflowed, whereas the flats, on being transferred immediately into an adequately protected shelter, are easily saved. As they become stronger they are taken out into the open. A flat, in order that it may be handled conveniently, should be at least 36 by 46 centimeters and 8 centimeters deep.

### PRICKING

Pricking is a process by which the crowded young seedlings are transplanted at convenient distances into new flats or newly prepared seed beds. Four centimeters each way is sufficient distance to give the seedlings space to thrive freely and uniformly. Pricking may take place or be begun on the sixth day after germination or when the first pair of true leaves are beginning to develop. The seedlings must be watered until they are ready to be transplanted into the fields or plots. They should be left in the open for at least one week before transplanting in order that they may harden and become used to conditions in the open field or plot.

### PREPARATION OF PLOTS AND FIELDS

There are two distinct cultures of tobacco; namely, field culture and plot culture. Field culture is the ordinary culture as practiced by the native planters. It is a culture for planting on a large or commercial scale, while the plot is used for planting on a small scale, in the production of tobacco for domestic or home use, for experiments, and for school work.

For general convenience the plots should be 4 by 10 meters or  $\frac{1}{250}$  hectare each and separated by a path at least one meter wide. The plots can be prepared with spading forks, rakes, and hoes. They do not need to be furrowed. They may remain level until planting time. If the ground to be used in school work has been long under considerable cultivation, it is advisable that the same ground be worked at least three times in order to bring about a uniform and upper distribution of the limited food supply in the soil. Furthermore, a liberal addition of manure and ashes to the soil will enrich it and help greatly in the production of a better crop of tobacco.

The preparation of the field is altogether different. One must use a carabao or vaca, big and small plows, and a harrow.

The ground should be thoroughly plowed several times, to

a depth of at least 30 centimeters, in order to allow enough space for the roots to extend well down, and then thoroughly harrowed. This will make it almost perfectly smooth all over and free from big masses of sods, or clods, which otherwise might roll over the seedlings, especially during cultivation. Thorough cultivation also checks the drying of the soil and at the same time distributes the food supply uniformly. With a well distributed food supply and a sufficient amount of moisture in the soil, the growth of the plants will be quick and normal.

Rapid growth of the tobacco plant is necessary in the production of wrapper leaves. Slow growth not only results in the incomplete development of the whole plant system but the plants run the risk of being overtaken by an early drought and of becoming subject to the attacks of insects during a much longer period.

### TRANSPLANTING

Seedlings fit for transplanting should be sound, very healthy, preferably dark green in color and free from all indications of branching. Any plant lacking two of the above qualities should be discarded. They should be transplanted about two months after the seed is sown, when the plants are about 15 centimeters high.

Great care must be observed at the time of taking the seedlings from the seed beds or flats, because the slightest injury to the stem or roots will retard the growth of the plant if it does not kill it altogether. If there has been no recent rain to soften the ground enough to make it easy to pull up the plants the necessary water must be supplied before attempting it.

The best time for transplanting is after 3 o'clock in the afternoon. On a cloudy day, however, transplanting can also be done in the morning. Cuts of banana petioles or clods of earth to serve as a protection of the young plants from excessive heat should always be on hand during the first 3 or 4 days after transplanting. After the work has been begun it should be carried on rapidly. If possible the whole field must be finished on the same day in order to insure a uniform stand of plants; this also facilitates the work of comparing mother plants during seed selection.

A special implement called the dibble is used in transplanting. In the production either of pure filler or ordinary tobacco, the native farmer may space his plants one meter each way; but he would get more from the same area with the same amount of labor, should he plant at a distance of not less than 1 meter by 80 centimeters. First, furrow the fields one meter apart length-

wise, then with the dibble, plant the seedlings 80 centimeters apart in the furrows or rows. With the dibble prepare a hole in the ground in which to place the young plant perpendicularly up to its neck. Then pack the soil around the plant to give its roots a firm hold and brace the stem. Then water the plant without wetting the leaves. The wet surface of the soil should be covered with dry soil in order to prevent soil-baking, which is fatal to the growth of the young plant. When the soil bakes, it shrinks and cracks so that considerable moisture escapes from the ground, while the lower part of the plant is strained.

For the production of wrapper tobacco, the most convenient distances apart to plant are 50 centimeters between the plants and 75 centimeters between the rows. This close planting will deprive the majority of the leaves, especially the lower ones, of a good deal of light, because the leaves intershade intimately. The leaves under such conditions develop thin, fine, and elastic and are therefore very suitable for wrapper. If the animal to be used in cultivating is rather large, the furrows may be made 80 centimeters to 1 meter apart. One meter by 50 centimeters will not only double the number of plants at present grown by the native farmer's one meter each way on the same area but will surely increase the yield of wrapper leaves at least 100 per cent.

#### CULTIVATION

Cultivation is the process of stirring the ground in order to keep the soil from ever hardening or becoming compact; it enables the roots to extend freely. Cultivation also eradicates weeds and conserves the moisture in the ground, as the dry powdery surface soil thus formed lessens the heating effect of the sun on the moist lower layer.

Cultivation is done by plowing the space between the rows of plants with a small plow or a tooth-cultivator. Unless unseasonable weather interferes, the whole field should be cultivated as often as every ten days, or at least once, immediately after a good rain, to prevent soil baking.

Plots can be cultivated just with garden hoes but the hand cultivator proper is preferable.

#### TOPPING AND SUCKERING

Topping and suckering are two distinct processes having the same end. Topping is the removal of the flower-head bud by pinching it off, while suckering simply means the removal of all suckers or buds at the axils or junctions of the leaves. The work of suckering and topping requires the exercise of some discretion.

On or about the time when the plant is about to flower, practically all the foods which are being taken in through the roots and the foods manufactured or made by the plant itself are sent to its upper end for the nourishment of the flower head and top leaves. This function or work goes on among healthy plants as well as among poor ones. Because of this fact, when a plant apparently is not in a vigorous condition it should be topped so that the plant food or juices instead of being consumed by the flower head, is utilized in the development of the standard leaves. When the plants are healthy and vigorous enough to satisfy the grower, they should not be topped at all, and he can then isolate or distinguish the mother plants to be used for seed for his next year's crop.

When wrapper leaves are to be produced, the grower must not top his plants until the flowers are beginning to bloom and when he does top them he must leave the top leaves so that the plant food will still go up. The lower leaves, having lost its supply of food, will begin to ripen, remaining light in color and thin in texture.

Suckers do not appear abundantly until after the farmer begins to top; and because they deprive the main plant of considerable food, they should be removed as soon as noticed. When the plants are very healthy, and the standard leaves have been harvested, two or three suckers may be allowed to develop and the leaves harvested from them may be used for cigarette tobacco.

### HARVEST

In the harvesting of cigar tobacco, the leaves should be primed, or gathered singly from the stalk as they severally reach the proper degree of ripeness. It is hard to make definite rules as to when the leaves are exactly ready to be primed. Of course it is easy to distinguish between the extremes, that is, between a green leaf and a leaf too ripe. Priming the leaves is, indeed a delicate operation. It is only through experience that one becomes a successful primer. This is especially true in the production of wrapper. A ripe wrapper leaf is different from a ripe filler leaf, the principal difference being that the former ripens earlier and with a lighter color.

Great care should be taken to harvest leaves at the proper stage of ripeness. If a leaf is picked green, it has when cured an undesirable dark color and a bitter flavor; if picked at the proper time, good color, texture and flavor are obtained. Over-ripe leaves on the other hand are affected in both texture and flavor.

Among visible indications of ripening are a yellowish color around the edges of the leaves, especially at the tips, occasional spots on the leaf surface, and in fact, a general change to a lighter greenish color. The lowest leaves, numbering from 3 to 5 and called sand leaves, are harvested first. Gradual priming is extended to the upper leaves from time to time. The leaves from the fifth leaf up to and including all not less than 30 centimeters long, the number of which varies, are called standard leaves. The uppermost leaves are called top leaves (retoños).

During harvest, priming should be done once per week. With this schedule it would take 5 or 6 primings to harvest the ordinary Cagayan crop.

While priming, the leaves are placed along the rows in piles as their weight becomes too heavy to carry along. These piles are in turn gathered into convenient baskets called "bilaos" or "labba" and then taken to the curing shed. If the shed is rather far from the fields, carts or "tangkals" pulled by carabaos or vacas, may be used.

Priming should be done preferably when the leaves are dry and absolutely free from dew not earlier than at least 9 o'clock in the morning. When they are dry they retain their gumminess which is important in the determination of their aroma and flavor. When the leaves are moist or wet, the gum is not only more or less diminished or removed altogether but the leaves sweat readily. Sweating produces an undesirable black color which kills or destroys the finish on the leaves, besides bringing about decay easily. For this reason it is not good to harvest leaves in the early morning when they are still covered with dew, nor after rains or showers.

#### POLING, STRINGING, STICKING AND CURING

The leaves must be piled perpendicularly on the floor of the drying shed with the tips of the leaves up and then separated in piles as to size and soundness. It should be understood, however, that this classification is not the final one but it is only for convenience.

The following is the Cuban method of poling and curing:

Considering that fresh leaves are much too brittle to handle, they are at first allowed to wilt during a sufficient time—from 10 to 14 hours—before they are strung or poled. A big needle and white string which is tied at the end of a pole varying from 2 to 4 centimeters in diameter and from 2.2 to 2.5 meters long are used. By driving the needle through the petiole, the leaves are strung alternately back to back so that the thin edges are turned in and the leaves alternately ride on the poles, with-





(a) Preparation of Ground, Dammao Tobacco Station, Isabela Province.



(b) Harvesting Tobacco Dammao Tobacco Station, Isabela Province.



out being pressed at the sides. The loaded poles are then hung on uniformly distanced racks in the shed for curing or for proper uniform drying. The spaces between the poles vary according to the size of the leaves.

The Filipino farmer uses a pointed bamboo stick called a "palillo." He runs the stick through the petiole or stalk of the leaves, pressing the leaves as close together as possible. This practice is bad because the leaves cannot thereby cure well, instead, they are subject to rot at any time. The use of the palillo is all right, though, provided the leaves are not pressed too close together. Allow the space of a finger width between them. More than fifty tobacco leaves should not be strung to a meter stick or palillo.

In poling or sticking, the sand leaves should not be mixed with the standards, nor the standards with the top leaves, because they do not cure the same.

The leaves should be given a slow and natural curing and never exposed to the direct rays of the sun. If they are cured in the open, the exposed edges of the leaves dry first, and the central part much later, which gives an irregular and unsatisfactory cure. Often, instead of curing, the hot sun burns and dries the leaves, with the result that the colors become uneven, the finish dead and the leaves as a whole become lifeless.

The leaves can only be cured properly by the use of especially built curing sheds (camarines de oreo) for that purpose.

#### CURING SHEDS

##### (CAMARINES DE OREO)

In the Philippines with the passage of Act 2613, gratuitous forestry licenses to cut all the necessary materials, including first group timbers, rattan and bamboo, from any public forest of the Philippines (except communal forests) are issued to tobacco growers, so a farmer can present no valid excuse for not having an adequate drying shed. Any tobacco planter can secure a license by simply applying to the nearest Forest Station or to any one of the authorized tobacco inspectors of the Bureau of Agriculture or of Internal Revenue stationed in different sub-districts of the Cagayan Valley.

A drying shed 12 meters long, 6 meters wide, and 3 meters high to the eaves can conveniently cure about a hectare of tobacco or about 10,000 plants, provided the grower removes the first leaves harvested from the shed as soon as they are thoroughly dry to make room for others. The drying shed should be provided with portable swinging walls of sawali, nipa or cogon, which can be easily opened and closed. These walls are

to be swung up open during good clear weather and closed or dropped when it rains or is too windy.

The following regulations are extracts from "Specifications for the Construcction of Tobacco Curing Sheds," drawn up by the Director of Agriculture, as amended, and effective February 1, 1919:

3. *Dimensions of buildings.*—Planters growing less than 6,000 plants shall build curing houses of such size and materials as will adequately serve this purpose. Curing house of planters growing 6,000 plants shall contain at least 120 cubic meters of interior space, exclusive of the space between the roof and the tie beams, the space and dimensions shall be increased proportionately as per the following table:

Number of plants	Length	Width	Height of walls
	Meters	Meters	Meters
6,000.....	8	6	2½
7,000.....	9	6	2½
8,000.....	10	6	2½
9,000.....	11	6	3
10,000.....	12	6	3

All curing houses, except those of planters growing less than 6,000 plants, shall have sides not less than 2½ meters high, and shall be not less than 6 nor more than 8 meters wide. The length will vary with the width.

Rains produce undesirable spots on the leaves and if wet leaves are not noticed, separated, and dried in time, these leaves are almost sure to rot. And furthermore, when the good leaves are contaminated, they also become moldy and apt to spoil. Breezes or winds cause rapid drying of the leaves, making them very brittle, very easy to break, and hard to handle.

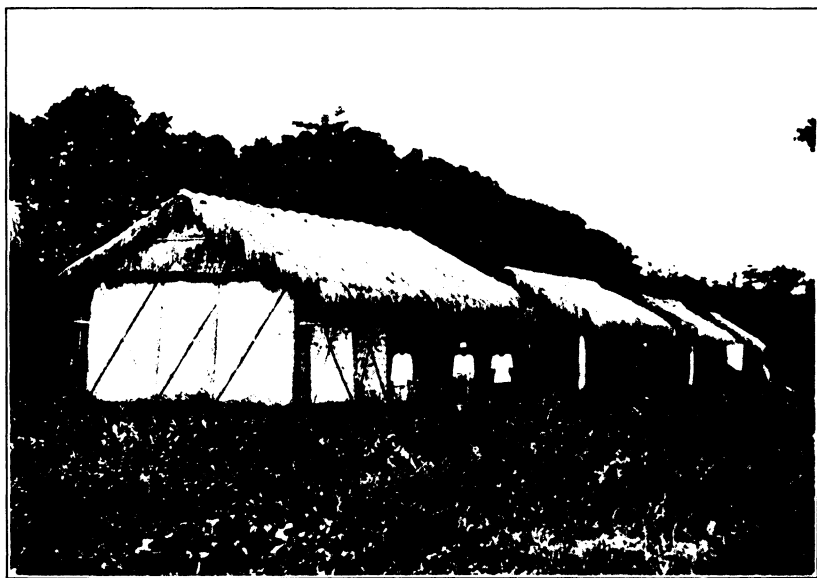
In the case of the small varieties of tobacco such as Sumatra, Vuelta Abajo (Cuban), and the typical Cagayan, by curing the leaves continually in the shade under a good drying shed, the sand leaves, or the first leaves of the plant, dry within a week, and the standards, or middle leaves, within 18 days. Larger varieties, with thick midribs and veins, will require almost a month to cure properly. Shade-cured tobacco leaves retain their natural quality and aroma as well as their elasticity.

After curing is completed, the leaves are piled in bulk (mandalas) and heat is generated within, which causes a change in the color and flavor of the leaves. This change is called fermentation.

The mandalas are made by piling the palillos or manos (hands) uniformly to form a more or less perfectly rectangular



(a) Sticking Tobacco Preparatory to Drying, Dammao Tobacco Station, Isabela Province.



(b) Model Tobacco Sheds, Dammao Tobacco Station, Isabela Province. (Note the Swinging Walls.)



block. The size varies according to the quantity of tobacco, although, for the sake of convenience, a mandala should not be more than 5 meters square nor over 3 meters high.

It should be clearly understood that proper curing of the leaf involves more than simply drying. Rapid drying prevents proper curing, while on the other hand too great humidity about the leaves induces blackening and rot. Curing involves various delicate fermentative and chemical changes which must be carefully controlled to produce the best results. It is not necessary for the farmer to possess technical knowledge concerning these processes, but he must have very special knowledge as to curing effects obtainable in a properly built *camarin de oreo*, and this he can gain only by experience. Leaves must be properly wilted before being poled, and wet leaves or leaves too turgid with water should neither be poled nor hung in the house.

In so far as consistent with avoiding rot by a safe margin, drying should be retarded as much as possible. Neither hot dry winds or air heavily laden with moisture should be allowed to blow through the hanging tobacco until curing is completed. This will indicate the procedure for proper management of the side ventilators of the house. In addition the house should be closed regularly every night. Constant attention should be given to the condition of the hanging tobacco in all parts of the house and mutilation governed accordingly. If the curing process proceeds normally the midribs will dry out without mold or rot and the butts become hard and brown; the leaf blades will first become yellowish in color and finally deepen to a clear brown. If, in spite of all precautions, certain poles show signs of mold or rot, they should be given several hours in the open sun, or if this is a general condition in the *camarin* due to heavy weather, then several small charcoal braziers should be set on the floor of the *camarin* until the danger is past.

Great care should be taken to see that the mandala does not overheat, because when the leaves are over-fermented they are likely to be spoiled or burned. For this reason a thermometer should always be on hand to register or take the temperature. The temperature within the mandala should rise gradually and should be allowed to reach about 38 degrees Centigrade. When this temperature is reached, the mandala must be rebuilt, this time the outside leaves of the pile are to be placed inside and the inside leaves put outside. The temperature in the second making (rebuilt mandala) is now allowed to reach 42 degrees Centigrade. The mandala must be rebuilt several times, a rise of not more than four degrees at a time being allowed until the temperature reaches 50 or 52 degrees Centigrade. Infection

with must really begins in the mandalas. The atmosphere is constantly filled with must spores that germinate like weeds as soon as the weather is favorable and a suitable medium is found. Therefore by preventing the constant exposure of certain leaves to the atmosphere, through frequent rebuilding of the mandalas, the propagation of must would be checked here at least. By this time the tobacco is perfectly fermented and the thermometer gradually begins to fall. To obtain the exact temperature inside, a convenient bamboo tube long enough to reach the center of the mandala, should be used. Tie a thermometer to the end of a strong stick, insert the stick in the bamboo tube, and whenever necessary, the inside temperature of the thick mandala can be ascertained by simple drawing out the stick and reading the thermometer.

It is true that the work of fermenting properly belongs to the manufacturer rather than to the farmer, because the former should be sure of the quality of his product; but most often the latter, awaiting a good price or for some other reason, cannot sell his tobacco right away. It is therefore very necessary that the grower should know exactly how to ferment his tobacco in order to preserve it until a sale is effected.

#### CLASSIFICATION

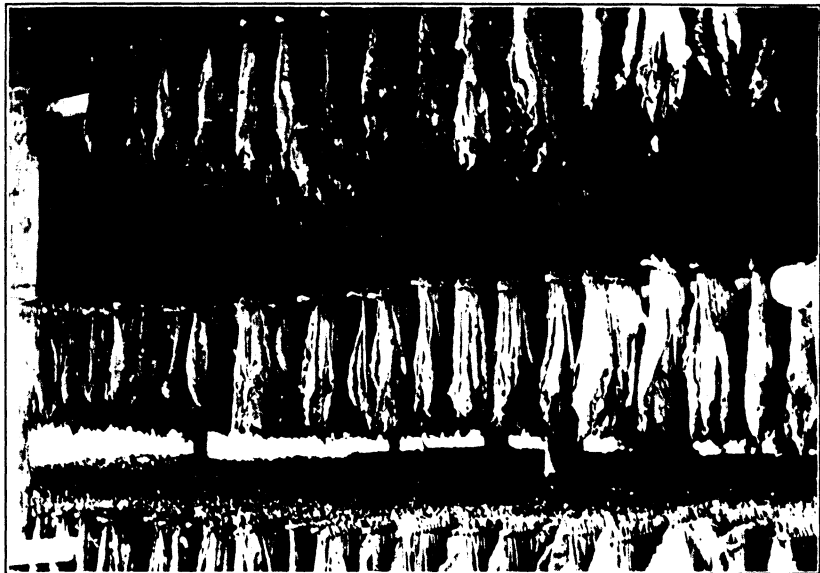
The following leaf tobacco classifications are from "Tobacco Inspection Regulations for Leaf and Manufactured Products of Tobacco," Administrative Order No. 35 of the Bureau of Internal Revenue as amended, April 28, 1919 and effective May 1, 1919:

(a) *As to origin*.—The term "Isabela" will apply to tobacco grown in the Province of Isabela; "Cagayan" to tobacco grown in the Province of Cagayan, and in the same way tobacco grown in other provinces will be designated by the name of the province of its origin.

(b) *As to length of leaf*.—Within each group there shall be six classes of leaf tobacco; viz, first, second, third, fourth, fifth, and sixth classes. The class of the tobacco, except the sixth class, is determined primarily by the length of the leaf and secondarily by the soundness and use of the leaf.

First-class tobacco leaf must have a length not less than 42 centimeters; second class, not less than 33 centimeters; third class, not less than 23 centimeters; and fourth class, not less than 16 centimeters. Tobacco leaf less than 16 centimeters will be classed as fifth or sixth class tobacco. A tolerance of 1 centimeter will be allowed in the lengths of each class, provided that





(a) Arrangement of Racks in the Curing Shed, Dammao Tobacco Station, Isabela Province.



(b) Sorting Dried Leaves Preparatory to Classification, Dammao Tobacco Station, Isabela Province.



the difference in each hand, or "pinongo," is as often above as below the minimum herein fixed.

(c) *As to soundness.*—After determining the class of the tobacco with reference to its origin and length, its soundness and use will be judged. First-class leaf tobacco must not be more than 5 per cent broken or worm-eaten; second class, not more than 8 per cent; third class, not more than 10 per cent. Fourth class, if it has the length of first or second class leaf and be not more than 50 per cent broken or worm-eaten, may be qualified by the word "Superior," but if its length is that of third or fourth and it is not more than 25 per cent broken or worm-eaten, it may be referred to as "Current." Fifth class must be at least 90 per cent sound of any size. Sixth class comprises all tobacco not entitled to a higher grade, and in this class shall be included all leaf which has not the requisite length of soundness for inclusion in a higher grade class, all leaf which lacks aroma, burning qualities or elasticity, and all leaf which is dirty, musty, moldy, rotted, dried out, sapless, or otherwise spoiled, which has been handled under insanitary conditions, or which has not been dried and cured in a curing shed constructed in accordance with the specifications of the Director of Agriculture.

(d) *As to use.*—First, second, third, and fourth class "superior" Isabela, Cagayan, and Nueva Vizcaya will be further classified under the terms "fine" and "coarse." If the owner so desires, he may further qualify the term "fine" by the terms "claro," "colorado," or "maduro" to indicate the colors of the tobacco, provided these words be truthfully applied.

(e) *Definition of "fine" and "coarse."*—"Fine" shall qualify leaf tobacco which is suitable for use as wrapper and its color, texture, and elasticity will be the points principally judged.

"Coarse" shall qualify leaf tobacco which is suitable for use for binder or for filler and for cigarettes. The aroma and burning qualities will be given prime consideration in determining the classification as to use.

(f) *Standard for export.*—First, second, third, and fourth class "superior" tobacco from Isabela, Cagayan, and Nueva Vizcaya provinces and first, second, and third class tobacco from other provinces are considered as standard for export to the United States.

#### PREPARATION OF THE HAND AND BUNCH

The following are from "Tobacco Inspection Regulations for Leaf and Manufactured Products of Tobacco," Administrative

Order No. 35 of the Bureau of Internal Revenue effective March 1, 1918:

(b) *Preparation of the hand and bunch.*—Whether tobacco be packed in bales, casks, or cases, it must first have been arranged into bunches (pinongos) or hands (manos) as prescribed below:

(1) *Pinongo.*—The leaves are taken from the pole on which strung for drying, and classified as to size, soundness, color, and texture, and leaves of the same classification gathered into bunches (pinongos) of not more than 50 leaves to the bunch (the number depending upon the size of the leaves) and tied together with twine or fiber at the stems (petioles). If the packer so desires, he may before baling, further gather four pinogogs together, and tie them at the stems, in the middle, and at the tips, forming what is known as a “carrot.”

(2) *Old-style hand.*—The leaves are taken from the pole on which strung for drying and classified as to size, soundness, color and texture.

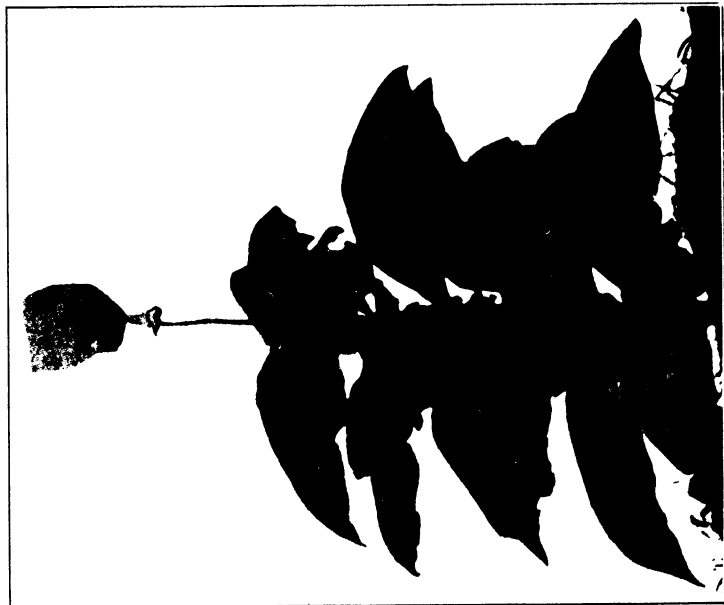
The leaves are then folded along the midrib so that the under side (dorsal aspect) of the leaves faces out, and leaves of the same classification gathered into bunches (manojitos) and a number of these bunches tied together into a hand in such a manner that the midribs are exposed. Each hand is tied at each end and in the middle with twine or fiber.

#### SELECTION OF SEED

When one visits any tobacco field today in the Islands, he will find that no two plants growing side by side are alike in detail. Two plants may resemble each other in height, size of leaves, number of leaves, and time of maturity but in all other respects; such as shape of leaves, appearance of veins, texture of the leaves, color of the leaves, etc., they differ entirely. Greater uniformity can be secured, and undesirable characters eliminated to a greater or less extent by careful seed selection.

During the first year of seed selection, only strong, vigorous plants should be selected as the mother plants for the following year's crop. The points necessary for the production of wrapper tobacco are: a wide leaf with well rounded tips and bases, fine veins, which are widely separated and which form either an obtuse or a right angle with the midrib. By selecting only mother plants of the same type with its improvements every year, the year will at last arrive when the grower will have a field which is strikingly uniform.

To make sure that no other inferior features should enter or

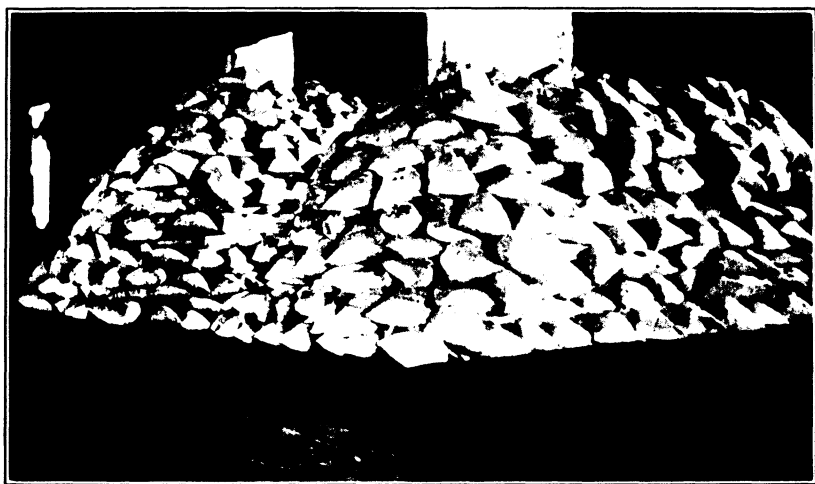


(a) Bagging Mother Plants to Insure Self-Pollination.



(b) Tobacco Seed Cleaning. Ilagan Tobacco Station, Isabela Province.





Selected Tobacco Seed-Cleaned, Separated and Sacked Ready for Distribution at the Dammas Tobacco Station, Isabela Province.





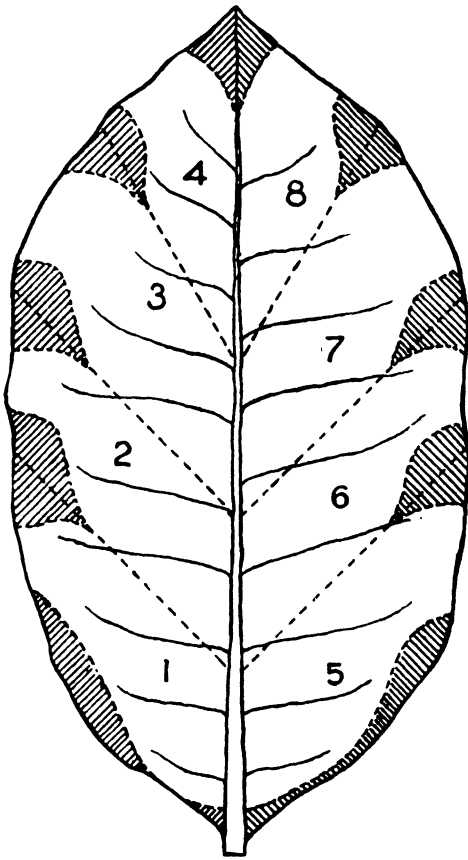


FIG. 1. Tobacco Leaf, Desirable Shape. (A Leaf of this Shape Will Furnish Eight Wrappers)

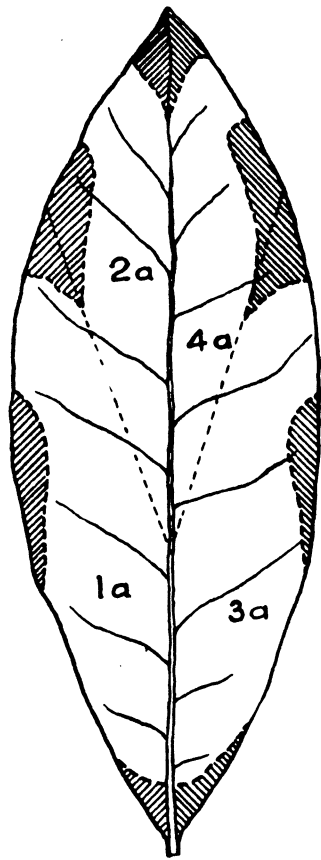


FIG. 2. Tobacco Leaf, Undesirable Shape. (A Leaf of this Shape Will Furnish Four Wrappers.)

be introduced into the selected type by flying insects or wind, the grower must avoid cross pollination among his selected plants. He must compel his plants to fertilize themselves or inbreed, by bagging the flowers. Bagging is a simple operation. Either a patented paraffined paper bag for the purpose or a light Manila paper is used. A heavy paper would bend the flower head, which would be an unnatural position adversely affecting the development of the seed. In any case it is well to place a strong stake close beside the plant and tie the paper bag to it.

Start bagging as the flowers begin to develop and just before they open. The bags should be sufficiently large, so as to allow space for the natural growth of the flower head. Tie

the bags tightly enough at the base of the flower head to prevent the passage of worms or insects capable of doing a great deal of harm either by cross-pollinating the flowers or by eating the ripening seed.

After 12 or 15 days, when the pods are formed, the bags can be removed and the seed allowed to develop or mature in the open. As the seed pods show signs of reaching maturity they should be cut off and hung up to dry for some time in a well protected place, preferably under a curing shed where they will not be wet, and when thoroughly dry the seed should be separated and stored in air-tight bottles. If possible place in the bottle a few tablespoonfuls of flaked naphthalene or mix in ashes to protect the seed from seed-eating insects.

It has been proven that a tobacco plant, however healthy it may be, produce a considerable number of light seeds and that these light seeds do not produce such good healthy plants as do heavy ones. There are special machines for cleaning and separating the heavy tobacco seed from the light in most municipalities in the tobacco districts, and every tobacco grower should bring his seed to the tribunal or municipal building and have it cleaned. In districts where there are no seed separators the seed should be winnowed as palay is; a wide flat basket called "bilao" or "igao" by the natives can be used for this.

#### DISEASES AND INSECT PESTS

We may consider that the first great enemy of tobacco is a fungus commonly known as "damping off." The appearance of this disease is characterized by the wilting of the seedlings. It spreads rapidly and the diseased plants appear as if rotted. The best way to check this disease is to sterilize the soil before planting. By sterilizing is meant the destroying of all germs or spores, as by heat, etc. Pouring hot water at a temperature of at least 62°C would clean the beds of fungus perfectly. There are other methods of sterilizing soils, such as burning rubbish on the surface of the plowed ground, roasting the ground over a pan, etc., but the boiling hot water method is probably the best for the average independent grower.

The cutworms are the worst enemies of the tobacco plant. They begin their attacks almost at the same time as the first true leaves begin to appear. They feed on the leaves voraciously, and are largely responsible for the lowering of the class of the tobacco. Many leaves that are otherwise first class according to size and soundness, are reduced to fifth or sixth class

by these worms. Their terrible work is further aided by a small green grasshopper. These leaf-eating insects can be controlled by hand-picking. When tobacco is grown on a large scale this work becomes rather difficult and unless the whole family, parents and children, go out into the field constantly every morning and afternoon to search for worms, they will gradually spread and ruin the crop.

The larva of a small moth sometimes eats its way into the stem of the tobacco plant and pupates inside. The result of this is that the plant suffers by the disturbance and its leaves droop, similar to the effect produced by the tobacco wilt.

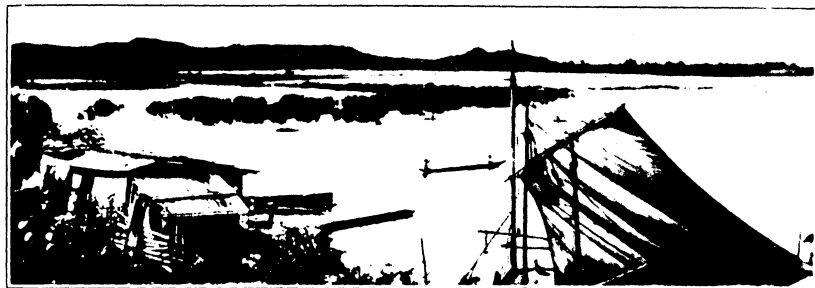
The tobacco wilt is due to a certain fungus which attacks the roots of the tobacco plant, causing the leaves to droop and wilt. It is contagious and therefore every plant that is attacked should be removed from the ground and burned as soon as noticed to avoid the spread of the disease.

#### REVIEW

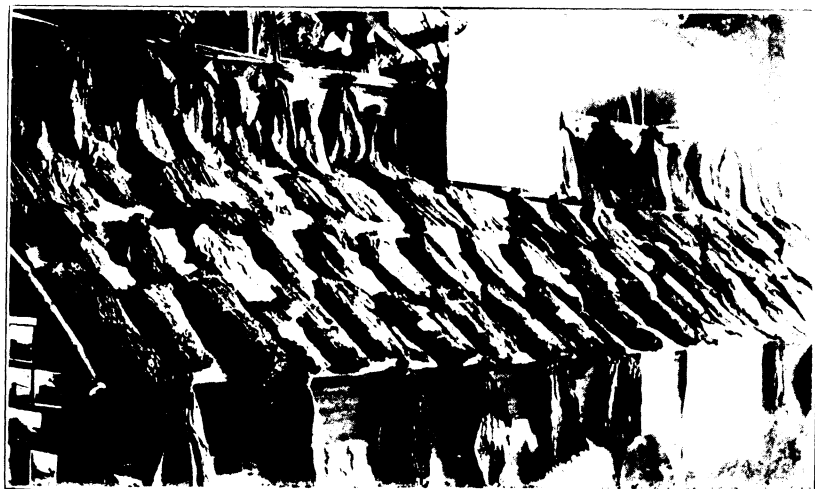
1. Describe the tobacco plant.
2. When is the best season for planting tobacco?
3. What are the most common varieties of Philippine tobacco? (a) Which is the most suitable for wrapper?
4. What are the three distinct products of tobacco called?
5. What kind of soil is most suitable to tobacco growing?
6. Why do tobacco fields which are subject to yearly inundations produce better tobacco?
7. What can be done to improve land which is not subject to inundations?
8. Describe how to prepare a good tobacco seed bed. (a) Why is it necessary to burn or heat thoroughly the ground which it to be used as a tobacco seed bed? (b) How can ants best be kept from eating the seed? (c) In what other way can tobacco seedlings be propagated other than in direct seed beds?
9. How should a tobacco field be prepared for planting?
10. How large should a tobacco seedling be before it is transplanted? (a) When is the best time to transplant seedlings?
11. What is the best distance apart to plant tobacco for filler purposes? (a) For wrapper purposes?
12. Why is it necessary to cultivate tobacco fields often?
13. When should topping be done to the tobacco plants and why? (a) Why is it necessary to remove most of the suckers?
14. When is the best time to harvest tobacco leaves and why? (a) How can you tell when the leaves are ready to be harvested?
15. Describe the Cuban method of poling (stringing) and curing tobacco. (a) Describe the Philippine way of poling and stringing the leaves. (b) How many is it best to put on a stick one meter long? (c) Why do leaves which are over-crowded on the polillo often rot? (d) How long should standard leaves be left to dry in a curing shed? (e) What is the result when tobacco gets wet by rain?

16. How large (state measurements) should a tobacco drying shed be to properly cure leaves from 10,000 plants? (a) Why are sides or swinging walls necessary on a tobacco drying shed?
17. Why are the tobacco leaves piled in bulk or mandala after they have been dried in a curing shed? (a) Describe the proper way to ferment tobacco.
18. What is the Government classification of tobacco as to size? (a) What classes constitute the standard for export?
19. What kind of plants should be selected as the mother plants and why? (a) Why should the flowers of a mother plant be bagged?
20. What are the principal insect pests which feed on the tobacco leaves? (a) How can they best be kept in check to prevent spreading in the fields? (b) What other diseases affect the tobacco plant? (c) How can the diseases be eradicated?





(a) Inundated Tobacco Fields, Ilagan, Isabela.



(b) Tobacco Exhibit, Philippine Carnival, Manila.











